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British Columbia's pay-for-performance experiment: Part of the solution to reduce emergency department crowding?☆

Amy H.Y. Cheng[a,*], Jason M. Sutherland[b]

[a] Royal Columbian Hospital, Department of Emergency Medicine, University of British Columbia, 330 E Columbia Street, New Westminster, BC V3L 3W7, Canada
[b] Centre for Health Services and Policy Research, School of Population and Public Health, University of British Columbia, 201-2206 East Mall, Vancouver, BC V6T 1Z3, Canada

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ABSTRACT

Background: Emergency department (ED) overcrowding continues to be a well-publicized problem in a number of countries. In British Columbia, a province in Canada, an ED pay-for-performance (ED P4P) program was initiated in 2007 to create financial incentives for hospitals to reduce patients' ED length of stay (ED LOS). This study's objectives are to determine if the ED P4P program is associated with decreases in ED LOS, and to address the ED P4P program's limitations.
Methods: We analyze monthly hospital-level ED LOS time data since the inception of the financial incentives. Since the ED P4P program was phased in at different hospitals from different health authorities over time, hospitals' data from only two regional health authorities are included in the study.
Results: We find association between the implementation of ED P4P and ED LOS time data. However, due to the lack of control data, the findings cannot demonstrate causality. Furthermore, our findings are from hospitals in the greater Vancouver area only.
Interpretation: BC's ED P4P was introduced to create incentives for hospitals to reduce ED LOS by providing incremental incentive funding. Available data indicate that the ED P4P program is associated with mixed successes in reducing ED LOS among participating hospitals.

1. Introduction

Spending on hospitals, or lack thereof, has been blamed for recent worsening of British Columbia's (Canada, BC) emergency room congestion. With a fair degree of rhetoric, ED wait times are kept in the public's eye; the wait times are routinely reported in several of Canada's provinces and appear in the media when waits become unusually long [1,2]. Whether right or wrong, from the public's perspective, wait times in the ED are viewed as an important indicator of the health of Canada's publicly funded health care system.

Emergency department overcrowding is not a novel problem in hospitals around the world [3,4]. There is a

* Corresponding author. Present address: St. Michael's Hospital, Department of Emergency Medicine, Division of Emergency Medicine, University of Toronto, 30 Bond Street, 1-008 Shuter, Toronto, ON M5B 1W8, Canada. Tel.: +1 416 970 8697.
E-mail addresses: amyhycheng@gmail.com (A.H.Y. Cheng), jsutherland@chspr.ubc.ca (J.M. Sutherland).

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sizable literature describing the multitude of factors that contribute to ED wait times and lengths of stay, including inappropriate use of EDs for non-emergent complaints, growth in population size, and decrease in health care resources and expenditures [5–7]. The most recent studies demonstrate that the biggest contributor to ED length of stay is hospital occupancy and ED inpatient boarding [8,9].

As experienced in BC, ED visit volumes and ED wait times have been increasing in major Canadian cities in the past decades [10]. A variety of policy options have been implemented to respond to the issue of long wait times. The most common response has been to add resources, including nursing staff and physicians, and to reconfigure the physical layout of existing EDs to include "Fast Track" areas that are intended to support the treatment and discharge of non-urgent patients quickly. Other responses have included ambulance diversions and increases in inpatient bed capacity to transition ill patients from the ED into inpatient beds [11]. More recent responses have included public reporting of wait times and financial incentives for reducing wait times in order to improve access [12].

In Canada, each province is responsible for organizing, delivering and funding healthcare for their residents, resulting in Canada having ten different provincial healthcare systems. Financed through a variety of mechanisms, each province's hospital-based care is publicly funded.

BC is the third most populous province in Canada, with approximately 4.4 million residents [13]. Publicly funded healthcare in BC is organized according to five geographically based health authorities, with one additional health authority that ensures funding for, and access to, provincially funded health services such as chronic kidney disease, tertiary cardiac surgery and transplant services [14]. The regional health authorities are publicly funded governing structures whose are responsible for the administration and delivery of health care within their geographically defined region. They receive their funding from the provincial government. The administration in each health authority disburses the funding to different providers according to the priorities in their own respective health region. Following this governance structure, hospital funding is first allocated from the BC provincial governments to each regional health authority, which then allocates funding to individual hospitals [15].

To untangle the role of funding in ED wait times in Canada, we note that in each province, hospitals are predominantly publicly funded through global budgets, which are "lump sums" in order to care for all patients. Funding hospitals using historically based global budgets, with medical inflation annual adjustments, stands in stark contrast with Organization for Economic Co-operation and Development (OECD) countries, which have largely transitioned to funding inpatient care based on the hospitals' case mix [16,17]. Historically based global budgets have been criticized for contributing to rationing of hospital care and creating long wait lists [18].

The current method for funding ED activity in BC's hospitals is straightforward. EDs are provided annual operating budgets by their hospital administrators who "split the pie" of the global budget of the hospital received from the Health Authority. In the hospital's allocation of their revenues among clinical and support departments, funding for EDs is largely based on previous years' allocations. In other words, the operating budget for the EDs is not funded on a fee-for-service basis.

While the hospitals' ED operational budgets are generally independent of the number or the acuity of patients who present to the ED during the current fiscal year, hospitals' ED budget can be increased by hospital administrators reallocating some portion of the hospitals' global budget. The ED budget is set at the beginning of the fiscal year (April to March), though it can be modified during the subsequent year if hospital administrators can demonstrate that the acuity and volume of patients have increased from year to year [14].

The ED operating budget excludes ED physician payments, which are paid to ED physicians directly from the provincial government, bypassing the Health Authority and hospital administration. Physicians are remunerated based on each patient seen, or in some cases, as a salary. The latter approach is known as an Alternative Funding Model and is more commonly used in teaching hospitals to reflect the dual expectations of an emergency physician as a clinician and an educator.

In the 2009–2010 fiscal year, there were in excess of 1.9 million visits to BC's hospitals' EDs with the volume of patient visits increasing approximately 4% each year [10]. Matched with a growing public perception of long ED waits, decreasing ED length of stay is very high on the BC government's policy agenda. In this gap between global budget funding policies and lengthening wait times, Canada's provinces are asking whether new models of funding, such as ED pay-for-performance (ED P4P), can reduce ED wait times while preserving the quality of care.

The role of financial incentives is new to Canada where global budgets have been the dominant method of funding hospital care for decades. In the fiscal year 2007–2008, BC's Ministry of Health initiated an ED P4P program as a pilot project to improve wait times in BC's EDs. This program spent in excess of $1.6 million in performance-related funding in its first year, an amount that has grown to $22 million in 2010 [10]. However, the potential for funding incentives to reduce ED wait times in Canada's healthcare system are not well understood.

In 2010, the government of BC created the BC Health Services Purchasing Organization (BC HSPO), an entity separate from the provincial government with a three-year budget provided by BC's Ministry of Health. The BC HSPO's responsibilities include the design, implementation and administration of financial incentives for BC's healthcare sector [19]. Since its inception, the BC HSPO subsumed the responsibility for the administration and funding of the ongoing ED P4P program.

Not all hospitals in BC participate in the ED P4P program, or are eligible for the P4P funding. The administrators from each health authority select hospitals to participate. Urban hospitals that have the highest number of ED visits and longest wait times are typically those that are selected to participate.

The financial incentives of the ED P4P program are based on each patient whose ED length of stay (ED LOS) time is less than the time target. Each patient's ED LOS

Table 1
Summary of ED P4P financial incentives by triage score, discharge location and wait time target.

CTAS score	Triage acuity	Discharge from ED location	ED length of stay time target	Funding incentive per patient
1	Resuscitation	Discharged home Admitted to inpatient	Less than 4 h Less than 10 h	$100 $600
2	Emergent	Discharged home Admitted to inpatient	Less than 4 h Less than 10 h	$100 $600
3	Urgent	Discharged home Admitted to inpatient	Less than 4 h Less than 10 h	$100 $600
4	Less urgent	Discharged home Admitted to inpatient	Less than 2 h Less than 10 h	$100 $600
5	Non-urgent	Discharged home Admitted to inpatient	Less than 2 h Less than 10 h	$100 $600

time target is severity-adjusted based on the Canadian Triage Acuity Scale (CTAS) category [20,21]. The CTAS is a validated instrument used widely in Canadian and international EDs. ED triage nurses assign patients to one of five CTAS acuity levels, each with a recommended time to initial physician assessment based on the patient's vital signs and presenting complaint [20,21]. A summary of ED LOS time targets, patient CTAS scores and funding incentives as per ED P4P is shown in Table 1. Notably, the ED LOS time targets for the BC P4P program is not consistent with the Canadian Association of Emergency Physician's recommendations of an ED LOS of less than 6 h for CTAS 1, 2 and 3 patients, and less than 4 h for CTAS 4 and 5 patients [22].

The ED LOS time target and per patient financial incentive for the BC P4P program were determined at the initiation of the program based on expert opinion. For each non-admitted patient, the incentive amount is approximately equal to a quarter day's salary of an ED nurse working in BC. For each admitted patient, the incentive amount is approximately equal to one and a half day's salary of an ED nurse.

The BC HSPO determines the minimum number of visits that each participating hospital must attain. This 'floor' number of ED visits that must occur for the hospital to qualify for the P4P incentive funding was also set by expert opinion, though each hospital met the criteria each period.

Based on each period's data regarding the number of patients that attain the target ED length of stay times in each CTAS category, the BC HSPO allocates and disburses the incremental ED P4P funding. The financial benefits of the ED P4P program accrue to the hospital's Health Authority, which then directs the incentive funding to the participating hospitals. The ED P4P funding does not accrue to physicians, whose incomes are not affected by the program, and who continue to be remunerated directly by the BC government.

It is the hospital's discretion how to allocate the ED P4P incremental funding; the funding can be earmarked to the ED or subsumed within the hospital's operating budget. Though the ED P4P program provides financial incentives to stimulate change in hospital's management of ED LOS, it does not provide direction to hospital administrators as to how to affect the changes necessary to reduce individual hospital's ED LOS. Although emergency physician's salaries are not affected by the P4P incentive payments, the hospital may use the P4P incentive funding to hire additional physicians and healthcare staff.

In the fiscal year 2010–2011, a total of $12.9 million incentive-based funding was paid by the BC HSPO to participating Health Authorities for the ED P4P program [23]. Now that the ED P4P's expenditures have spanned several years, there is considerable policy interest across Canadian provinces in assessing whether financial incentives are related to shorter length of stay in BC's EDs. The purpose of this study is to analyze whether incentive funding for EDs are associated with shorter ED patient length of stay.

2. Data and methods

The basis for BC's ED P4P program is the ED LOS, which is the time from each patient's initial ED presentation to discharge from the ED. The patient's initial ED presentation time is taken as the time when the patient registers and is entered into the registration system by the registration clerk. Patients' discharge times are entered into the registration system by the unit clerk and/or the ED nurses, often after the patient has already left the department. Taken together, the presentation time and discharge time data entered into each hospital's computerized registration system form the basis of the time-based incentives used by the BC HSPO for supplemental hospital funding.

A designate, usually a nurse manager, from each of the participating hospitals' ED submits summaries of the time data at the end of each reporting period to the BC HSPO. There are 13 periods for which data is reported each fiscal year. Hospitals not participating in the incentive program do not collect ED LOS data.

In the first three years of the ED P4P program, only ED LOS affected incentive funding. No additional clinical data informing ED's quality affected the funding incentive. However, very recently, a patient-level reporting system for patient's ED visits has been implemented which will facilitate future analyses between ED LOS and clinical data.

At intermittent times, BC HSPO conducts audits of the time data submitted by hospitals. Hospitals' ED computerized tracking systems are contrasted against the data summaries submitted to the BC HSPO. To date, there are

no mechanisms to change submitted data from hospitals, nor is there a policy statement or a penalty regarding the submission of erroneous data.

Prior to joining the ED P4P program, ED wait and ED LOS data was not routinely collected in hospitals or reported to the BC HSPO. As a result, a pre- and post-analysis of the effectiveness of the ED P4P incentive is not possible. The current analysis is thus limited to examining the rate at which ED patients meet the ED length of stay time thresholds after the funding incentives had been implemented to observe whether patients wait times are decreasing.

Health authorities' hospitals joined the ED P4P program at different points in time. The ED P4P program began in 2007 with four hospitals from the Vancouver Coastal Health Authority (VCHA). Four hospitals from the Fraser Health Authority (FHA) joined the program in September 2008. Both Vancouver Coastal and Fraser Health Authorities encompass the most populous regions of BC, including Vancouver, a major metropolitan city. Hospitals from Vancouver Island Health Authority and Interior Health Authority joined the program in January 2010 and thus, are not included in the analysis since their data is sparse and has not yet been verified.

A multivariate Poisson regression model for serially correlated count data was used to model the number of monthly visits that attain the P4P financial incentive over time, controlling for structural characteristics of the hospital: the number of hospital beds, whether the hospital is a teaching hospital, Health Authority and hospital-level effect, which is nested within health authorities. The number of monthly visits was also included in the Poisson regression model. While the patient characteristics of acuity (CTAS level) were included in the model, additional covariates, such as patient age, were not available for inclusion in the multivariate model.

Two separate analyses were conducted, separated according to the patients' disposition location. The first analysis consists of patients who were discharged from the ED directly to home, and the second analysis consists of patients who were admitted as inpatients to the hospital from the ED.

Aggregated monthly hospital level ED length of stay time data are used with permission of the BC Ministry of Health, while ethics approval was obtained from the Behavioural Research Ethics Board at the University of British Columbia.

3. Results

The number of ED visits during each fiscal year in the ED P4P participating-hospitals from April 2009 to March 2012 is summarized in Table 2. Overall, the trend in the number of ED visits is increasing over time in BC's hospitals. The increases are approximately uniform across acuity levels (CTAS levels). The absolute number of visits is trending upwards in all four VCHA hospitals in the program, with the possible exception of Richmond hospital, which is constant. In contrast, the four hospitals in FHA have experienced mixed changes in volume. Unlike Burnaby General and Royal Columbian hospitals that have experienced stable number of ED visits over the two years, Surrey Memorial and Abbotsford General have experienced steady increases in ED visits over time.

4. ED LOS

For patients who were discharged directly from the ED to home, we analyzed the rate at which patients' ED LOS met the ED LOS time thresholds. The results of the multivariate analysis shown in Table 3 indicate that, for VCHA, despite increasing volumes of ED visits, hospitals maintained the rate over time at which patients met the ED LOS time thresholds ($p = 0.57$). That is, since the regression parameter is not statistically significant, over time and on average, ED LOS times have been held constant in VCHA's hospitals. In contrast, for FHA, there was a decrease over time in the rate at which hospital's patients met the ED LOS time thresholds ($p < 0.01$).

At the onset of the funding initiative in fiscal year 2009–2010, the highest rate of ED visits meeting the ED LOS time threshold was Burnaby General Hospital, followed closely by St. Paul's Hospital. However, the findings for more recent periods diverge; while St. Paul's slightly improved its rate of ED visits meeting the ED LOS time target, Burnaby General's expected rate has declined, a change in divergence of 3%, or approximately 180 patients per period meeting the time threshold (based on the monthly volume of 6000 visits).

Over the study period, Abbotsford Regional Hospital's rate of meeting the ED LOS time threshold steadily declined to be the lowest among the study hospitals, such that at the last fiscal period analyzed (2011–2012), only 49% of these patients' ED LOS time was less than the threshold required for ED P4P funding, as compared to 66% at both Burnaby and St. Paul's.

The multivariate findings also reveal that the number of hospital beds was negatively related to attaining the ED LOS time threshold ($p < 0.01$), though the parameter estimate of -0.01 suggests this effect is clinically irrelevant. Also, teaching hospitals were significantly more likely to attain the ED LOS threshold than non-teaching hospitals ($p < 0.01$).

In the second analysis, the rate at which patients admitted as inpatients to the hospital from the ED within the 10-h ED LOS time threshold was analyzed. There was a statistically significant decrease in the rate over time at which FHA's hospitals admitted patients from the ED within the 10-h ED LOS time threshold ($p = 0.02$). As shown in Table 4, over the study period among FHA hospitals, there was a wide split in hospitals' performance. Abbottsford Regional has shown considerably lower rates in admitting patients from the ED within the 10-h threshold in comparison to the other FHA hospitals.

In contrast, the rate at which hospitals admitted patients from the ED within the 10-h ED LOS time threshold in VCHA's hospitals has improved over the study period ($p < 0.01$). As shown in Table 4 within VCHA, St. Paul's Hospital was most likely to admit ED visits to hospital within the 10-h threshold, closely followed by Vancouver General.

The analysis of ED LOS among patients admitted from the ED also reveals that the number of hospital beds was unrelated to attaining the ED LOS time threshold ($p = 0.15$).

Table 2
Number of ED visits of health authorities' hospitals participating in the BC's ED P4P program.

BC Health Authority (Year joining the ED P4P)	Hospital	Fiscal year visits		
		2009–2010	2010–2011	2011–2012
Fraser (2008)		269,794	283,430	294,823
	Abbotsford Regional	53,320	57,497	61,571
	Burnaby General	69,642	69,797	72,354
	Royal Columbian	60,724	63,815	63,797
	Surrey Memorial	86,108	92,321	97,101
Vancouver Coastal (2007)		233,739	239,031	252,982
	Vancouver General	75,451	76,270	81,061
	Richmond	45,361	43,737	45,614
	Lions Gate	49,260	51,492	53,547
	St. Paul's	63,667	67,532	72,760

Table 3
Summary of the multivariate regression model (for time series data) of the rate of ED visits that attain the ED length of stay time thresholds, adjusting for Health Authority and time trend.

Health Authority	Hospital	Adjusted rate – mid-point of fiscal year (%)		
		2009–2010	2010–2011	2011–2012
Fraser (FHA)	Abbotsford Regional (FHA)	51	50	49
	Burnaby General (FHA)	68	67	66
	Royal Columbian (FHA)	61	60	59
	Surrey Memorial (FHA)	61	60	58
Vancouver Coastal (VCHA)	Lion's Gate (VCHA)	60	60	61
	Richmond (VCHA)	62	63	63
	St. Paul's (VCHA)	65	66	66
	Vancouver General (VCHA)	52	52	52

However, teaching hospitals were statistically significantly more likely to attain the ED LOS threshold than non-teaching hospitals for admitted patients ($p < 0.01$).

5. Discussion

The BC government, and later the BC HSPO, expected that incremental funding for hospitals would decrease ED wait times and ED LOS if the policies were effective. The magnitude of the additional funding was such that during the fiscal year 2011–2012, approximately $13 million was paid out to FHA and VCHA for hospitals that participated in the ED P4P program, or on average, approximately $1.5 million per participating hospital.

While the premise of P4P programs is to provide financial incentives for health care professionals to improve patient outcomes, multiple reviews have cautioned against the use of time-based outcome measurement, since P4P programs that reward practitioners for working within a specific time have generally been ineffective [24]. At the same time, a review of P4Ps has found that more positive outcomes are achieved when financial incentives are provided to individual practitioners and health care teams rather than to a hospital or health system [25]. However, the relevance of the literature linking P4P to these hospital-based findings is questioned since BC's ED P4P does not remunerate individual clinicians, but rather Health Authorities that then direct the funds to the hospitals. Consequently, this analysis contributes new information relevant to single payer healthcare systems used in many European countries.

The findings regarding BC's hospitals' response to the ED P4P program are mixed for the government. VCHA's hospitals that participated in the ED P4P program are maintaining or improving their rates of patients meeting the ED LOS time thresholds in spite of more visits to their EDs. In

Table 4
Summary of multivariate regression model (for time series data) of the rate of ED visits that attain the 10 h wait time threshold among patients that are admitted, adjusting for Health Authority and time trend.

Health Authority	Hospital	Adjusted rate – mid-point of fiscal year (%)		
		2009–2010	2010–2011	2011–2012
Fraser (FHA)	Abbotsford Regional (FHA)	42	39	36
	Burnaby General (FHA)	53	49	45
	Royal Columbian (FHA)	52	48	44
	Surrey Memorial (FHA)	51	48	44
Vancouver Coastal (VCHA)	Lion's Gate (VCHA)	51	52	52
	Richmond (VCHA)	52	52	52
	St. Paul's (VCHA)	61	62	62
	Vancouver General (VCHA)	58	58	59

the first analysis of ED LOS, VCHA's hospitals maintained their rate ($p = 0.57$) of non-admitted patients meeting the ED LOS time threshold, while the second analysis revealed VCHA's hospitals experienced an improvement ($p < 0.01$) in rates of admitted patients meeting the 10 h threshold. VCHA's ability to decrease ED LOS times point to some hospital successes, which should be further studied.

In contrast, FHA's hospitals are moving in the opposite direction, with poorer ED LOS time results over time. In other words, in FHA hospitals, non-admitted patients have been waiting longer in more recent times ($p < 0.01$). In addition, the decrease in the rate of patients being admitted within 10 h is declining in FHA hospitals ($p < 0.01$).

As an artifact of how BC's ED P4P program was constructed, neither the BC HSPO nor the provincial government prescribes how each hospital is expected to achieve the target ED LOS; thus, each hospital is left to develop its' own initiatives to meet the ED length of stay time targets. There is no formal data collection by the BC HSPO on the P4P implementation context or uptake of the program that enables the evaluation of the process to take place. Consequently, this analysis of ED LOS time threshold data sheds little light on the operational programs or methods hospitals have used to attract new revenue through the ED P4P program. Future evaluations of this incentive program would benefit from a qualitative review of contextual factors affecting hospital's responses in order to create generalizable knowledge.

Nonetheless, for the BC HSPO, tasked with creating incentives for reducing ED wait and ED LOS, the results provide feedback that the financial incentives are potentially not working as intended to reduce ED wait and ED LOS across all hospitals, particularly those in FHA. On this point, the literature provides few clues regarding the appropriate amount of the financial incentive necessary to induce hospitals to respond to the incentives [26].

Relative to amounts described in other studies, it is unclear whether the financial incentives provided by the BC HSPO are sufficient for hospitals to pursue long-term changes in staff, equipment or resources; especially considering that, relative to hospital's budgets, the incentive amounts of the ED P4P program are very modest, less than 1% of hospital's budgets. Given the small magnitude of the incentive, one may question whether a larger incentive and longer commitment to the ED P4P program by the BC government and BC HSPO was a necessary condition for hospitals to invest in more resource-demanding projects, such as re-designing physical capacity or infrastructure that would improve ED access and decrease ED LOS times.

Evidence regarding the relationship between the size of an incentive and effectiveness is unclear; a recent study demonstrated that a higher amount of financial incentive (4% of hospital budget) may be associated with a successful 0.9% reduction in mortality in England of a hospital-based P4P program [27]. The same P4P program, when implemented in the US, with a reduced incentive amount of 2% of the hospital budget, was not associated with a mortality reduction [27]. However, these findings derived from a hospital-based P4P program based on patient outcomes may not be generalized to the ED setting in which the BC ED P4P program is based.

Others have demonstrated that changes in cost-sharing between the hospital and the emergency department, decision making and financial transparency, departmental decision making autonomy, and high level of health care worker commitment and sense of belonging all contribute to improving productivity [28,29]. More specifically, the most recent literature of a successful P4P program suggests that a high financial incentive, regular meetings between hospitals to share lessons learned, and mandatory participation in the P4P program may be key factors for the program's success [27]. However, due to its design, the current study on the BC ED P4P program does not provide details regarding each hospital's management of the program and is unable to address questions regarding some of the aspects associated with successful P4P program, such as regular meetings between hospitals or whether the monthly P4P funding data was shared by the administrators with the ED health workers. This gap possibly undermined the potential motivation and feedback that these results can have on the staff who are able to make a difference on a patient's ED LOS and clinical outcome.

The mixed findings in the current study should give government pause; does the ED P4P program improve access, or is it simply another mechanism to transfer unrestricted operating funds to hospitals? Weaknesses in the data leave policy-makers wondering how the ED length of stay times would have fared without the additional attention, data collection and staffs' focus on lengths of waits that the ED P4P program provided. Reporting on additional outcomes, such as patient-reported satisfaction or cost per ED visit, would have supported a more comprehensive evaluation of the program. Nonetheless, if the program continues beyond its three-year mandate that ends in 2013, additional hospitals and longer time periods will provide additional feedback on the funding policies in future years. Either way, as other provinces and countries consider strategies to improve access to congested EDs, the results of the targeting spending on ED P4P in BC will be closely watched.

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